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| 09/909,074      | 07/19/2001  | Joyce S.Oey Hewett   | 2000.075200/TT4629  | 9763             |

23720 7590 08/02/2004

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| EXAMINER |
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NGUYEN, KHIEM D

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| ART UNIT | PAPER NUMBER |
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2823

DATE MAILED: 08/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/909,074

Applicant(s)

HEWETT ET AL.

Examiner

Khiem D Nguyen

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-13 and 15-41 is/are pending in the application.
- 4a) Of the above claim(s) 16-41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-13 and 15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

HSIEN-MING LEE  
PRIMARY EXAMINER

**DETAILED ACTION*****Response to Amendment***

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn. A new rejection is made as set forth in this Office Action. Claims (1-2, 4-13, and 15-41) are pending in the application, in which claims 16-41 are withdrawn from consideration.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 4-13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson et al. (U.S. Pub. 2002/0032499) in view of Uzoh et al. (U.S. Patent 6,685,814).

In re claim 1, Wilson et al. disclose a method of controlling a conductive layer deposition process comprising (See page3, paragraphs [0023]- [0025] and **FIGS. 1** and 4): depositing a conductive layer such as copper above a first semiconductor wafer based upon a deposition recipe (page 1, paragraphs [004] and [0008] and page 7, paragraph [0061]); measuring a thickness of the conductive (copper) layer deposited on the semiconductor wafer and determining whether the measured thickness of the conductive (copper) layer is within a predetermined tolerance 76 (page 5, paragraph [0042] and **FIG. 4**); and, revising the deposition recipe according to at least one predetermined model if

the measured thickness of the conductive (copper) layer is not within the predetermined tolerance 78 (page 5, paragraph [0042] and FIG. 4).

Wilson et al. do not explicitly disclose revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath and an anode-cathode spacing of the deposition recipe if the measured thickness of the conductive layer is not within the predetermined tolerance as recited in the independent claim 1.

Uzoh et al., however, disclose that the thickness of an electroplated conductive layer may be affected by revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath (col. 2, lines 49-62). In view of recognition that the chemical concentration of an electroplating bath affect the thickness of the conductive layer, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teaching of Wilson et al. and Uzoh et al. to achieve or revising the deposition recipe in Wilson by altering the chemical concentration and furthermore to produce more uniform electroplated film in electroplating processes (col. 2, lines 57-62).

In re claims 2 and 5, Wilson et al. disclose wherein depositing a conductive layer above the first semiconductor wafer further comprises deposition a copper layer above a first semiconductor wafer (page 1, paragraphs [004] and [0008] and page 7, paragraph [0061]); measuring the thickness of the conductive layer further comprises measuring the thickness of the copper layer; determining whether the measured thickness of the conductive layer is within a predetermined tolerance further comprises determining

whether the measured thickness of the copper layer is within the predetermined tolerance (page 5, paragraph [0042] and FIG. 4); and, revising the deposition recipe according to at least one predetermined model further comprises revising the deposition recipe if the measured thickness of the copper layer is not within the predetermined tolerance (page 5, paragraph [0042] and FIG. 4);

In re claim 4, Wilson et al. disclose using the newest parameter derived in step 80 (FIG. 4) in processing subsequent microelectronic workpieces (paragraph [0042]). Therefore, Wilson inherently teaches depositing a conductive layer above a second semiconductor wafer based upon the revised deposition recipe.

In re claims 6-8, Wilson et al. disclose a method of controlling a conductive layer deposition process comprising (page 3, paragraph [0025] and **FIGS. 1 and 4**): depositing a conductive layer such as copper above a first semiconductor wafer based upon a deposition recipe (page 1, paragraph [004] and [0008] and page 7, paragraph [0061]); measuring a thickness of the conductive (copper) layer at a plurality of predetermined pattern of locations (page 7, paragraph [0061] and Table 1); calculating a value representing the measured thickness measured at the plurality of locations (page 9, paragraph [0088]); determining whether the calculated value is within a predetermined tolerance (page 5, paragraph [0042] and **FIG. 4**); and, revising the deposition recipe based upon at least the calculated value if the calculated value is not within the predetermined 78 (page 5, paragraph [0042] and **FIG. 4**).

Wilson et al. do not explicitly disclose revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath and an

anode-cathode spacing of the deposition recipe based upon at least the calculated value if the calculated value is not within the predetermined tolerance as recited in independent claim 6.

Uzoh et al., however, disclose that the thickness of an electroplated conductive layer may be affected by revising at least one parameter selected from the group consisting of a chemical concentration of an electroplating bath (col. 2, lines 49-62). In view of recognition that the chemical concentration of an electroplating bath affect the thickness of the conductive layer, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teaching of Wilson et al. and Uzoh et al. to achieve or revising the deposition recipe in Wilson by altering the chemical concentration and furthermore to produce a more uniform electroplated film in electroplating processes (col. 2, lines 57-62).

In re claims 9 and 10, Wilson et al disclose calculating a value representing the measured thickness comprises calculating an average (arithmetic mean) of the plurality of thickness measurements (page 9, paragraph [0088]).

In re claims 11 and 12, Wilson et al. disclose wherein determining whether the calculated value is within a predetermined tolerance 76 comprises calculating a measure of a degree of dispersion of the plurality of thickness measurements about the calculated value and comparing the measure of the degree of dispersion to a predetermined statistical distribution selected from the group consisting of the standard deviation (normal distribution) (page 9, paragraphs [0088] and [0091] and page 5, paragraph [0042] and FIG. 4).

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In re claim 13, Wilson et al. disclose wherein revising the deposition recipe further comprises revising the deposition recipe according to at least one predetermined model (page 5, paragraphs [0042]-[0043]).

In re claim 15, Wilson et al. disclose using the newest parameter derived in step 80 (FIG. 4) in processing subsequent microelectronic workpieces (paragraph [0042]). Therefore, Wilson inherently teaches depositing a conductive layer above a second semiconductor wafer based upon the revised deposition recipe.

### *Conclusion*


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.  
July 29, 2004

HSIEN-MING LEE  
PRIMARY EXAMINER

  
7/29/2004